

***Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*)  
Forest**

COMMON NAME	Red Spruce - (Fraser Fir) / (Catawba Rhododendron, Great Rhododendron) Forest
SYNONYM	Red Spruce - Fraser Fir Forest (Evergreen Shrub Type)
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)

ALLIANCE                      *Abies fraseri* - *Picea rubens* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL      1

USFWS WETLAND SYSTEM              Upland

RANGE

**Globally**

This community is restricted to the highest mountain systems of the southern Appalachians in eastern Tennessee and western North Carolina. It is not known from Virginia but could possibly occur there.

***Great Smoky Mountains National Park***

This community was sampled on the Mount Le Conte quadrangle on steep, exposed, south-facing slopes in an area north of Mount Kephart known as "The Boulevard," on steep slopes above Rocky Spur, and on steep slopes on the southern flanks of Mount Le Conte. It does not occur on the Cades Cove quadrangle but is likely in other high elevation areas (above 5500 feet elevation) of the Park.

ENVIRONMENTAL DESCRIPTION

**Globally**

This forest is best developed between 5100-6000 feet elevation (1550 and 1830 meters) but may occur at lower elevations and is typically found on moderately steep to steep, convex slopes. Soils are highly variable, from deep mineral soils to well-developed boulderfields, where a thin organic layer and moss mat overlie the rocks and there are pockets of mineral soil in deep crevices between boulders. The dominant soils are Inceptisols with scattered occurrences of Spodosols at the highest elevations (White *et al.* 1993). Generally, soils can be described as shallow and rocky, with well-developed organic and A horizons. All soils in these high elevation forests are low in base saturation, high in organic matter, and are acid in reaction (pH 3-5), with a high aluminum content. The moisture regimes of these areas are mesic to wet due to high rainfall, abundant cloud cover, fog deposition, and low temperatures. The climate has been classified as perhumid, with the temperature varying elevationally from mesothermal to microthermal. The regional geology is dominated by complexly folded metamorphic, sedimentary, and igneous rocks of the Precambrian and early Paleozoic age, including phyllites, slates, schists, sandstones, quartzites, granites, and gneisses.

***Great Smoky Mountains National Park***

This community was found on steep, middle to high slopes at elevations between 5100 and 6000 feet (samples ranged in elevation from 5320 to 5780 feet) over organic soils with thick litter layers. In some areas ice storms and Balsam Woolly Adelgid (*Adelges piceae*) affect the canopy structure.

MOST ABUNDANT SPECIES

**Globally**

<u>Stratum</u>	<u>Species</u>
Tree canopy	<i>Picea rubens</i> , ( <i>Abies fraseri</i> )
Tall shrub	<i>Rhododendron catawbiense</i> , <i>Rhododendron maximum</i>

***Great Smoky Mountains National Park***

<u>Stratum</u>	<u>Species</u>
Tree canopy	<i>Picea rubens</i>
Tall Shrub	<i>Rhododendron catawbiense</i>

CHARACTERISTIC SPECIES

**Globally**

*Picea rubens*, *Abies fraseri*, *Rhododendron catawbiense*

**Great Smoky Mountains National Park**  
*Picea rubens*, *Rhododendron catawbiense*

VEGETATION DESCRIPTION

**Globally**

This association includes forests of the southern Appalachians, within the range of *Abies fraseri*, dominated by *Picea rubens* with or without *Abies fraseri*. Other species may occur in the canopy/subcanopy but with low coverage. The shrub stratum is moderate to dense and dominated by evergreen species such as *Rhododendron catawbiense*, *Rhododendron maximum*, and *Rhododendron carolinianum*. Shrub coverage is most dense on drier, convex slopes. Other shrub species with minor coverage may include *Vaccinium simulatum*, *Vaccinium erythrocarpum*, *Viburnum nudum* var. *cassinoides*, *Diervilla sessilifolia*, and *Viburnum lantanoides*. Extensive patches of *Abies fraseri* seedlings and standing dead stems of *Abies fraseri* may be common. Herb coverage is typically low, but moist, north-facing sites may have *Oxalis montana*, *Athyrium filix-femina* ssp. *asplenoides*, *Dryopteris campyloptera*, and mosses dominating beneath the shrub stratum.

**Great Smoky Mountains National Park**

This community has a closed canopy dominated by large *Picea rubens*. Some occurrences may have standing dead *Abies fraseri* and a more open canopy due to *Abies* mortality or damage by ice storms. The subcanopy may have scattered stems of *Betula alleghaniensis* or *Prunus pensylvanica*, but these species form a minor part of the canopy coverage (less than 25 percent). The shrub stratum is dense (70-100 percent coverage) and dominated by *Rhododendron catawbiense*. In some occurrences on the flanks of Mount Le Conte, *Leucothoe fontanesiana* can dominate the short-shrub stratum. Other species that may be present as a minor part of the shrub stratum include *Abies fraseri*, *Ilex montana*, *Kalmia latifolia*, *Picea rubens*, *Rhododendron maximum*, *Rubus canadensis*, *Sorbus americana*, *Vaccinium corymbosum*, *Vaccinium erythrocarpum*, and *Viburnum lantanoides*. The herbaceous stratum is sparse, typically with less than 10 percent coverage. Herbaceous species include *Aster acuminatus*, *Athyrium filix-femina*, *Dryopteris campyloptera*, *Dryopteris intermedia*, *Monotropa uniflora*, and *Oxalis montana*. The ground cover is dominated by thick and spongy litter and duff layers and by downed woody debris.

OTHER NOTEWORTHY SPECIES

Rare or regionally rare vascular plant species associated with this community include *Abies fraseri*, *Betula papyrifera* var. *cordifolia*, *Botrychium oneidense*, *Calamagrostis canadensis*, *Cardamine clematidis*, *Carex projecta*, *Carex ruthii*, *Chelone lyonii*, *Geum geniculatum*, *Glyceria nubigena*, *Phegopteris connectilis*, *Poa palustris*, *Prenanthes roanensis*, *Rhododendron carolinianum*, *Rugelia nudicaulis*, *Stachys clingmanii*, *Stellaria corei*, and *Streptopus amplexifolius*. Rare non-vascular plants include *Bazzania nudicaulis*, *Brachydontium trichodes*, *Gymnoderma lineare*, *Leptodontium excelsum*, *Metzgeria temperata*, *Nardia scalaris*, *Plagiochila corniculata*, and *Sphenolobopsis pearsonii*.

Animals endemic to high elevation areas of the southern Appalachians include Carolina Flying Squirrel (*Glaucomys sabrinus coloratus*), Yonahlossee Salamander *Plethodon yonahlossee*, Weller's Salamander (*Plethodon welleri*), Spruce-fir Moss Spider *Microhexura montivaga*. Rare animal species that are northern disjuncts include Black-capped Chickadee (*Parus atricapillus*, and Northern Saw-whet Owl (*Aegolius acadicus*). The spruce-fir moss spider (*Microhexura montivaga*) is specific to this community type. The spider populations seem to be decreasing with the decline of these forests. As the canopy thins, moss desiccation increases, thus affecting the spider's habitat.

This community provides breeding habitat for many migrant landbird species. Typical bird species that utilize this habitat include Canada Warbler (*Wilsonia canadensis*), Black-throated Blue Warbler (*Dendroica caerulescens*), Blackburnian Warbler (*Dendroica fusca*), Black-throated Green Warbler (*Dendroica virens*), Gray Catbird (*Dumetella carolinensis*), Verry (*Catharus fuscescens*), and Solitary Vireo (*Vireo solitarius*).

An exotic insect, the Balsam Woolly Adelgid (*Adelges piceae*), invaded the southern Appalachians in the late 1950s and has drastically altered the last undisturbed remnants of this community. This exotic pest kills mature *Abies fraseri* within seven years of infestation.

CONSERVATION RANK                      G1

RANK JUSTIFICATION

This community has a naturally restricted distribution and has been subject to major acreage reduction during the early part of the 20th century and rapid condition decline in the past 30 years. Modern threats include atmospheric pollution deposition and damage by *Adelges piceae*, the exotic Balsam Woolly Adelgid. Well-developed, undisturbed examples of this community are extremely rare.

DATABASE CODE                      C EGL007130

## COMMENTS

### **Globally**

A similar forest, *Picea rubens* – (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Oxalis montana* - *Dryopteris campyloptera* - *Hylocomium splendens* Forest (CEGL007131), has an understory dominated by deciduous shrubs, herbs, and bryophytes and occurs on more mesic sites than the one described here. Similar forests occur in the central and northern Appalachians but have *Abies balsamea* as the fir component, less dense herb and bryophyte cover, and lack a *Rhododendron*-dominated understory (Oosting and Billings 1951; Whittaker 1956; Crandell 1958).

As a result of human disturbance, primarily large-scale corporate logging (1880-1930), sometimes followed by fire and massive soil erosion, present day *Picea rubens* and *Abies fraseri* vegetation in the southern Appalachians is estimated to cover only 48 percent (69 square kilometers) of the presettlement area (Cogbill and White 1991).

### **Great Smoky Mountains National Park**

On the Mount Le Conte quadrangle, this forest grades into forests dominated by *Picea rubens* and *Betula alleghaniensis* or forests dominated by *Picea rubens*, *Tsuga canadensis*, and *Betula alleghaniensis*. Some occurrences of this community may be floristically similar to *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Oxalis montana* - *Solidago glomerata* Forest (CEGL006256). Examples on the Mount Le Conte quadrangle include stands of old-growth forest.

## REFERENCES

Brown 1941, Bruck 1988, Busing et al. 1988, Cogbill and White 1991, Crandall 1958, Crandall 1960, Davis 1930, Korstian 1937, McLeod 1988, Nicholas and Zedaker 1989, Nicholas et al. 1992, North Carolina Natural Heritage Program 1993, Oosting and Billings 1951, Ramseur 1960, Rawinski 1992, Schafale and Weakley 1990, Schofield 1960, Stephenson and Adams 1984, Stephenson and Clovis 1983, Wentworth et al. 1988, White 1984, White and Cogbill 1992, White and Pickett 1985, White et al. 1993, Whittaker 1956, Zedaker et al. 1988